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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/615,042	07/08/2003	Valeriy Sukharev	03-0509	3892

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EXAMINER

FENTY, JESSE A

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 03/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/615,042	Applicant(s) SUKHAREV ET AL.	
	Examiner Jesse A. Fenty	Art Unit 2815	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

**A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.**

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 08 July 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>7/8/3</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 3-5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- a. Claim 3 recites the limitation "the copper" in line 6 of the claim. There is insufficient antecedent basis for this limitation in the claim.

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 2, 3 (as best understood), 4 and 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lu et al. (US 2004/0018748 A1) in view of Moslehi (U.S. Patent No. 6,124,198).

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In re claims 1-4 and 6-9, Lu et al. (Figs. 1-3) discloses a semiconductor device including one or more dielectric layers (26, 28, 30) and a first copper deposit (22) and method of making the same comprising:

Forming a trench (31B) in the substrate;

Forming a via (31A) in the substrate to the copper deposit;

Depositing a tantalum nitride intermediate liner layer (section [0027], lines 15-20).

Depositing by PVD a layer of aluminum-copper alloy (section [0027], lines 20-23) in the trench and via and on the first copper deposit;

Depositing a second copper deposit (34) onto the aluminum-copper alloy, wherein the aluminum-copper alloy is disposed between the first (22) and second copper deposits and between the second copper deposit (34) and at least one of the dielectric layers (28); and

Polishing the copper (section [0034], lines 10-12).

Lu does not expressly disclose the Aluminum-Copper alloy comprising 0.5% Copper. However, such a combination of layers is a standard in the industry (Farrar; column 1, lines 65-67; column 2, lines 20-21) and it would have been obvious for one skilled in the art at the time of the invention to use Al-0.5% Cu alloy to line the trench of Lu for the purpose, for example, of improving the electromigration lifetime of the interconnect scheme (Moslehi; column 1, lines 32-38).

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3. Claims 5 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lu in view of Moslehi as applied to claims 3 and 8 above, and further in view of Young (US 2004/0002211 A1).

In re claims 5 and 10, Lu in view of Moslehi discloses the method and device and of claims 3 and 8 respectively, wherein the intermediate liner layer comprises tantalum nitride (Lu; section [0027], lines 15-20) but does not expressly disclose the liner layer comprising a Ta/TaN. Young discloses the use of Ta/TaN as a barrier layer (36, 28) in an interconnect scheme. It would have been obvious for one skilled in the art at the time of the invention to use a Ta/TaN barrier layer as disclosed by Young in place of the TaN layer of Lu/Moslehi for the purpose, for example, of hindering copper from diffusing into adjacent interlevel dielectric layers (Young; section [0041], lines 3-16).

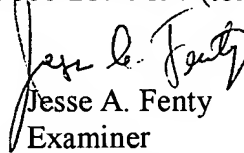
### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jesse A. Fenty whose telephone number is 571-272-1729. The examiner can normally be reached on 5/4-9 1st Fri. Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 571-272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Jesse A. Fenty  
Examiner  
Art Unit 2815